# CLAIMS

1. A method for producing a replication master (10) having a surface with low roughness, comprising the steps of:
- forming said master (10) such as to have a desired external surface shape which at least partially corresponds to a counterform of a surface of an object (18, 20) to be produced by replication;
- treating said external surface of said master (10) to obtain a predetermined surface roughness value; and
coating at least a part of said master (10) with a smoothening layer (16),
characterized in that said smoothening layer (16) is made of a soluble material, in particular a soluble polymer material, for example a PMMA photoresist.

2. The method according to claim 1, characterized in that said smoothening layer (16) is applied by dip-coating or spin-coating said master (10) with a liquid smoothening material and hardening said smoothening material.

3. The method according to claim 1 or 2, characterized in that it furthermore comprises the step of coating at least a part of said master (10) with a release layer.

4. The method according to claim 3, characterized in that said release layer is made of a soluble material, in particular a soluble polymer material, for example a PMMA photoresist.

5. The method according to any of the preceding claims, characterized in that it furthermore comprises the step of coating at least one additional smoothening layer on top of or under said soluble smoothening layer (16).

6. The method according to claim 5, characterized in that at least one of said additional smoothening layers is made of a non-soluble material.

7. The method according to claim 5 or 6, characterized in that it furthermore comprises the step of coating a thin spacer layer, preferably a thin metallic spacer layer, between at least two adjacent smoothening layers.

8. A replication method for producing a smooth object (18, 20) having a low surface roughness, comprising the steps of:
- producing a replication master (10) by a method according to any of the preceding claims;
- coating at least a part of said master (10) with an object material such that the surface of said object (18, 20) corresponds to a counterform of said master (10); and
- releasing said object (18, 20) from said master (10).

9. The method according to claim 8, characterized in that said releasing step comprises dissolving said smoothening layer (16) and/or said release layer on top of said master (10) by a solvent.

10. The method according to claim 8 or 9, characterized in that it furthermore comprises the step of providing glue (20) to said object (18, 20) and/or to an object support (12) and glueing them together before executing said releasing step.

11. The method according to claim 10, characterized in that the amount of said glue (20) is chosen such as to fill gaps between said object (18, 20) and said object support (12).

12. The method according to any of claims 8 to 11, characterized in that said object (18) is an optical device (18), e.g. a reflection or transmission monolayer, bilayer or multilayer.

13. The method according to claim 12, characterized in that it furthermore comprises the step of characterizing said optical device (18) on top of said master (10) before executing said releasing step.

14. The method according to claim 13, characterized in that said characterization step comprises performing a profilometry or reflectometry measurement of said optical device (18).

15. The method according to any of claims 8 to 11, characterized in that said object (20) is a substrate (20a) for an optical device (18).

16. The method according to claim 15 when dependent on claim 10, characterized in that said object material and the material of said glue (20) are identical.

17. The method according to claim 16, characterized in that said object material and said glue (20) comprise epoxy resin.

18. The method according to any of claims 15 to 17, characterized in that it furthermore comprises the step of coating at least a part of said master (10) with a protection layer on top of said smoothening layer (16) or release layer before applying said object material.

19. A replication master (10) for producing a smooth object (18, 20) having a low surface roughness, said master (10) having an external surface shape which at least partially corresponds to a counterform of a surface of said object (18, 20), wherein at least a part of said master (10) is coated with a smoothening layer (16), characterized in that said smoothening layer (16) is made of a soluble material, in particular a soluble polymer material, for example a PMMA photoresist.

20. The replication master (10) according to claim 19, characterized in that it is furthermore at least partially coated with a release layer.

21. The replication master (10) according to claim 20, characterized in that said release layer is made of a soluble material, in particular a soluble polymer material, for example a PMMA photoresist.